

# Facility Specific Phosphorus Variance Data Sheet

**Directions:** Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

## Section I: General Information

**A. Name of Permittee:** Lime Ridge Wastewater Treatment Facility  
**B. Facility Name:** Lime Ridge WWTF  
**C. Submitted by:** Wisconsin Department of Natural Resources  
**D. State:** Wisconsin **Substance:** Phosphorus **Date completed:** December 1, 2020  
**E. Permit #:** WI-0036447-07-0 **WQSTS #:** (EPA USE ONLY)  
**F. Duration of Variance** **Start Date:** April 1, 2021 **End Date:** March 31, 2026  
**G. Date of Variance Application:** October 8, 2019  
**H. Is this permit a:** ☒ First time submittal for variance  
☐ Renewal of a previous submittal for variance (Complete Section X)

## I. Description of proposed variance:

Lime Ridge is seeking an individual phosphorus variance from the total phosphorus water quality criterion (WQC) of 75 ug/L (0.075 mg/L). Total Maximum Daily Load (TMDL)-derived water quality based effluent limits of 0.085 lb/day monthly average and 0.28 lb/day six-month average are currently applicable for this facility. The permittee was issued a WPDES permit containing a stringent phosphorus WQBEL (NR 217 Wis. Adm. Code) on October 1, 2015. The final water quality based effluent limitations for Lime Ridge are TMDL derived limits approved by U.S. EPA for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. This TMDL resulted in limitations for phosphorus that must be included in WPDES permits. The initial criteria and the site specific criteria allocations are equivalent for this permittee.

As part of the permit requirements, the permittee evaluated their compliance options and determined that adaptive management was not practical and plant upgrades to meet the phosphorus WQBELs were not economically feasible. The effluent phosphorus concentration for this discharge is currently 5.43 mg/L and 0.59 lb/day (30-day 99th percentile). The permittee submitted their variance application and documents based on limits calculated for the 2015 permit reissuance. Lime Ridge operates a recirculating sand filter treatment system. These systems are not designed to remove phosphorus. Chemical addition is not effective because there is minimal retention time for phosphorus precipitate to form and settle and no biosolids handling capability to remove the resulting phosphorus containing sludge. Influent to the facility is strictly domestic wastewater and significantly reducing phosphorus from such sources is not feasible.

This phosphorus concentration reflects on-site phosphorus optimization measures that occurred during the previous permit term. The proposed permit contains a requirement to implement a phosphorus pollutant minimization program (PMP).

## J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Jennifer Jerich	jennifer.jerich@wisconsin.gov	920-387-7886	Permit Drafter
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Sarah Luck	Sarah.Luck@wisconsin.gov	608-275-3230	Parts II D-H and K-N, III G-H

## Section II: Criteria and Variance Information

**A. Water Quality Standard from which variance is sought:** 75 ug/L (0.075 mg/L) TMDL WLAs of 8 lbs/year maximum annual load and 0.0219 lb/day maximum daily load expressed as 0.085 lb/day monthly average and 0.28 lb/day six-month average  
**B. List other criteria likely to be affected by variance:** N/A  
**C. Source of Substance:**

Narrows Creek is located in the Narrows Creek and Baraboo River watershed which is 176.33 mi<sup>2</sup>. Land use in the watershed is primarily forest (31.70%), agricultural (30.90%) and a mix of grassland (25.80%) and other uses (11.60%). This watershed has 368.35 stream miles, 331.44 lake acres and 4,694.54 wetland acres. Narrows Creek (1276400) was placed on the impaired waters list in 2014 for total phosphorus. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data exceeded 2016 WisCALM listing criteria for the Fish and Aquatic Life use, however, available biological data did not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category).

**Citation:** PRESTO is a statewide GIS-based tool that compares the average annual phosphorus loads originating from point and nonpoint sources within a watershed. More information about this model is available at <http://dnr.wi.gov/topic/surfacewater/presto.html>.

**D. Ambient Substance Concentration:** >0.075 mg/L ☐ Measured ☒ Estimated  
☐ Default ☐ Unknown

**E. If measured or estimated, what was the basis? Include citation.**

Narrows Creek was assessed during the 2016 listing cycle; the total phosphorus sample data exceeded the 2016 WisCALM listing criteria for the Fish and Aquatic Life use. Narrows Creek is also part of the 2019 approved Wisconsin River TMDL addressing Total Phosphorus and Total Suspended Solids which are exceeded.

**Average effluent discharge rate:** 0.0108 MGD (Oct 2015 - April 2020) **Maximum effluent discharge rate:** 0.114 MGD (Oct 2015 - April 2020)

**F. Effluent Substance Concentration:** 1-day 99<sup>th</sup> percentile value = ☒ Measured ☐ Estimated  
10.0 mg/L (1.7 lbs/day) ☐ Default ☐ Unknown  
4-day 99<sup>th</sup> percentile value =  
7.01 mg/L (1.0 lb/day)  
30-day 99<sup>th</sup> percentile value =  
5.43 mg/L (0.59 lb/day)  
(Oct 2015 - April 2020)

**G. If measured or estimated, what was the basis? Include Citation.** Effluent data reported during October 2015 - April 2020.

**Citation:** Submitted electronic Discharge Monitoring Forms

**H. Type of HAC:** ☐ Type 1: HAC reflects waterbody/receiving water conditions  
☐ Type 2: HAC reflects achievable effluent conditions  
☒ Type 3: HAC reflects current effluent conditions

**I. Statement of HAC:** The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its Phosphorus PMP. Thus, the HAC at commencement of this variance is 5.5 mg/L, which reflects the greatest phosphorus reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's PMP. The current effluent condition is reflective of the available on-site optimization measures that have already occurred and will need to continue during the next permit term with requirements to submit annual reports documenting on-going reduction and optimization of phosphorus. This HAC determination is based on the economic feasibility of available compliance options for the permittee at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

**J. Variance Limit:** 5.5 mg/L monthly average

**K. Level currently achievable (LCA):** 5.5 mg/L monthly average

**L. What data were used to calculate the LCA, and how was the LCA derived? (Immediate compliance with LCA is required.)**

The variance limit is set at the concentration the permittee is able to meet without investing in additional "temporary" treatment. This is consistent with the limits expressed in s. NR 217.17, Wis. Adm. Code and additionally, this averaging period is consistent with the limit expression in accordance with s. NR 217.14(2), Wis. Adm. Code.

**M. Explain the basis used to determine the variance limit (which must be  $\leq$  LCA). Include citation.** The variance limit of 5.5 mg/L was set equal to the current interim limit. The 30-day  $P_{99}$  of phosphorus monitoring data reported is 5.43 mg/L. This is a value that the permittee is able to consistently meet with its current treatment processes and reflects on-site optimization that has already occurred.

**Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below:**

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ 6

During the previous permit term Lime Ridge evaluated its options for meeting the phosphorus WQBELs. Currently, residential users pay approximately \$50.00 per month (\$600.00 annually) for sewer service. The median average residential user rate for communities with 1,500 people in the state is approximately \$36.17 per month (\$434 annually) according to MSA's 2016 Sewer User Charge Survey. The financial impact for each alternative is provided in Table 3.1. Residential sanitary sewer usage accounts for 95% of the total sanitary sewer usage in the Village based on the sewer accounts for 2018. Therefore, effects on user rates for each Phosphorus Compliance Alternative were estimated by dividing 95% of the Annual Worth among 79 residential users to calculate additional pollution control costs per household. The total annual cost per user is calculated by adding the current annual residential user rate plus the additional annual pollution control cost per user. The Median Household Income (MHI) for the Village of Lime Ridge, according to the Wisconsin DNR 2020 Clean Water Fund Program, is \$40,833.

**Table 3.1 – Financial Impact**

Compliance Alternative	Annual Worth	Additional Pollution Control Cost Per Household	Total Annual Cost Per Household
Filtration System	\$71,800	\$863.61	\$1,463.61
Spray Irrigation	\$45,000	\$541.15	\$1,141.15
Multi-Discharger Variance	\$36,600	\$439.84	\$1,039.84

\*NOTE: Total Annual Cost Per Household = Current Treatment Cost + (New Pollution Control Cost x 95%). The current treatment cost per household is \$600.00 per year.

**Citation:** 4<sup>th</sup> Year Phosphorus Report (Facility Plan); prepared by Delta 3 Engineering, Inc.

### Section III: Location Information

<b>A. Counties in which water quality is potentially impacted:</b>	Sauk County
<b>B. Receiving waterbody at discharge point:</b>	Narrows Creek (Narrows Creek/Baraboo River Watershed, LW22-Lower Wisconsin River Basin) in Sauk County.
<b>C. Flows into which stream/river?</b>	Baraboo River
<b>How many miles downstream?</b>	20 miles
<b>D. Coordinates of discharge point (UTM or Lat/Long):</b>	43.46771° N 90.14863 °W
<b>E. What are the designated uses associated with this waterbody?</b>	Warm Water Sport Fish (WWSF), non-public water supply
<b>F. Describe downstream waters:</b>	<p>Receiving Water: Narrows Creek (Narrows Creek/Baraboo River Watershed, LW22-Lower Wisconsin River Basin) in Sauk County. Narrows Creek flows into the Baraboo River which flows into the Wisconsin River. The Baraboo River and Wisconsin River are both listed as impaired.</p> <p>Stream Classification: Warm Water Sport Fish (WWSF)</p>
<b>G. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the applicable criterion of the substance?</b>	Not applicable since Narrows Creek is listed as impaired for total phosphorus (listed 4/1/2014) at the outfall location and is within an EPA-approved TMDL area which includes downstream waters that are also impaired and above phosphorus criteria.

<b>H. Provide the equation used to calculate that distance.</b> Not applicable – see above.		
<b>I. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:</b> There are no other permittees with phosphorus variances that discharge to Wolf Creek (see attached map).		
<b>Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet.</b>		
<b>J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below.</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown		
River Mile	Pollutant	Impairment
<b>Section IV: Pretreatment</b> (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)		
<b>A. Are there any industrial users contributing phosphorus to the POTW? If so, please list.</b> N/A		
<b>B. Are all industrial users in compliance with local pretreatment limits for phosphorus? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)</b>  N/A		
<b>C. When were local pretreatment limits for phosphorus last calculated?</b> N/A		
<b>D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW</b> N/A		
<b>Section V: Public Notice</b>		
<b>A. Has a public notice been given for this proposed variance?</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<b>B. If yes, was a public hearing held as well?</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
<b>C. What type of notice was given?</b> <input checked="" type="checkbox"/> Notice of variance included in notice for permit <input type="checkbox"/> Separate notice of variance		
<b>D. Date of public notice:</b> _____ <b>Date of hearing:</b> _____		
<b>E. Were comments received from the public in regards to this notice or hearing?</b> <i>(If yes, please attach on a separate sheet)</i> <input type="checkbox"/> Yes <input type="checkbox"/> No		
<b>Section VI: Human Health</b>		
<b>A. Is the receiving water designated as a Public Water Supply?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
<b>B. Applicable criteria affected by variance:</b> N/A		
<b>C. Identify any expected impacts that the variance may have upon human health, and include any citations:</b> No direct impacts to human health related to phosphorus.		
<b>Section VII: Aquatic Life and Environmental Impact</b>		
<b>A. Aquatic life use designation of receiving water:</b> Warm Water Sport Fish Community, non-public water supply		
<b>B. Applicable criteria affected by variance:</b> 75 ug/L (0.075 mg/L), Fish and Aquatic Life Criteria		
<b>C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:</b> The water quality and sport fisheries in the watershed are significantly affected by nonpoint sources of pollution. As a result, the watershed has been ranked as a high priority for nonpoint source pollution reduction. Lime Ridge WWTF's contributing		

load of phosphorus to the river is therefore not expected to adversely impact aquatic life beyond that which already results from non-point contributions.

**D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:**

**Birds**

Whooping Crane (*Grus americana*) – Experimental Population

**Clams**

Higgins eye (pearly mussel) (*Lampsilis higginsii*) - Endangered

Sheepnose Mussel (*Plethobasus cyphus*) - Endangered

**Flowering Plants**

Northern wild monkshood (*Aconitum noveboracense*) - Threatened

Prairie bush-clover (*Lespedeza leptostachya*) - Threatened

Eastern prairie fringed orchid (*Platanthera leucophaea*) - Threatened

**Insects**

Karner blue butterfly (*Lycaeides melissa samuelis*) - Endangered

Rusty patched bumble bee (*Bombus affinis*) - Endangered

**Mammals**

Northern Long-Eared Bat (*Myotis septentrionalis*) - Threatened

**Reptiles**

Eastern Massasauga (*Sistrurus catenatus*) - Threatened

**Citation:** U.S. Fish & Wildlife Service – Environmental Conservation Online System (<http://www.fws.gov/endangered/>) and National Heritage Index (<http://dnr.wi.gov/topic/nhi/>)

**Section VIII: Economic Impact and Feasibility**

**A. Describe the permittee's current pollutant control technologies (treatment processes):**

Lime Ridge owns and operates a recirculating sand filter for treatment of domestic wastewater. The annual average design flow is 0.0154 million gallons per day (MGD) and the actual annual average in 2019 was 0.0112 MGD. Each residence or business has a septic tank that discharges wastewater to the sanitary sewer system leading to the wastewater treatment facility. The facility includes a settling tank with wastewater pumped to a three-cell recirculating sand filter. Underdrains collect treated effluent, which may be pumped back up to the sand filter and mixed with influent wastewater or discharged as treated effluent to Narrows Creek. During summer the effluent is disinfected with chlorine and then dechlorinated before being discharged to the stream down a cascade step aerator.

**B. What modifications would be necessary to comply with the current limits? List additional treatment processes and/or technologies available. Include any citations.**

The compliance options available to Lime Ridge include: alternative compliance options such as implementing an adaptive management program designed to lower the receiving water phosphorus concentration below the water quality criterion by implementing non-point source reduction measures in the watershed and developing a water quality trading plan to offset the amount of phosphorus being discharged by the facility. Another option is to comply with the water quality criterion by constructing traditional phosphorus treatment such as biological phosphorus removal, precipitating phosphorus from the effluent by chemical addition and tertiary filtration, or some combination thereof. Construction of a new regional wastewater treatment facility was evaluated however it was economically infeasible due to the high cost to construct force main, pump stations, and facility upgrades to handle a second community's flow (Hill Point WWTF).

**C. Identify any expected environmental impacts that would result from further treatment, and include any citations:**

All available compliance options would reduce phosphorus concentrations in Narrows Creek, and thus have net environmental benefits. Construction of traditional phosphorus treatment would have temporary environmental impacts related to construction activities.

<p><b>D. Is it technically and economically feasible for this permittee to modify the treatment process to comply with the water quality-based limits?</b></p> <p>It is not economically feasible at this time to upgrade Lime Ridge's treatment process to meet the water quality-based effluent limit for phosphorus as all options would result in sewer user costs in excess of 2% of median household income.</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><b>E. If treatment is possible, is it possible to comply with the limits on the substance?</b></p> <p>It is not economically feasible to comply with the phosphorus limits.</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><b>F. If yes, what prevents this from being done? Include any citations.</b></p> <p>See above.</p>	
<p><b>G. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:</b></p> <p><b>A) Alternative I – Filtration System</b></p> <p>In order to meet the proposed effluent TP limits, the existing WWTF may need to be upgraded with addition of chemicals and effluent filter technology. Effluent from the RSF would enter a coagulation/flocculation tank where coagulant for Phosphorus removal would be added possibly along with polymer to aid in flocculation. Effluent from the coagulation/flocculation tank would then flow to a disk filtration, sand filtration, or ultrafiltration system where the precipitated Phosphorus-containing solids would be removed.</p> <p><b>B) Alternative II – Spray Irrigation</b></p> <p>A spray irrigation system has been investigated to eliminate the required low effluent Total Phosphorus limit by converting the surface discharge of the WWTF to a groundwater discharge through the use of spray irrigation. Components would include construction of a storage lagoon, spray irrigation system, and an effluent pump station to deliver the effluent to the irrigation system.</p> <p><b>C) Alternative III – Seepage Cells</b></p> <p>A seepage cell system has been investigated to eliminate the required low effluent Total Phosphorus limit by converting the surface discharge of the WWTF to a groundwater discharge through the use of seepage cells. The WWTF would then be required to meet additional groundwater water quality standards as provided in Table 2.2. Standards are lower than current effluent concentrations for <b>Chloride and Total Nitrogen</b> which would require additional treatment. Since there is no economical means to treat for Chloride, seepage cells would not be a viable option.</p> <p><b>G) Alternative IV – Multi-Discharger Variance (MDV)</b></p> <p>The Village is eligible for the Multi-Discharger Variance. However, the Village will be unable to meet the new interim limit of 1.0 mg/L as required by the MDV. The Village would require a substantial WWTF upgrade including a chemical addition building, coagulation/flocculation tank, sludge storage tank, etc.</p> <p><b>Citation:</b> 4<sup>th</sup> Year Phosphorus Report (Facility Plan); prepared by Delta 3 Engineering, Inc.</p>	
<p><b>H. Describe the economic impacts of compliance:</b> Existing sewer user costs for Lime Ridge are \$600 per household per year, or 1.47% of the median household income (MHI) of \$40,833. The existing treatment plant requires improvements and upgrades to maintain compliance with current permit and administrative code requirements that are not related to phosphorus removal. A project to perform collection system improvements, upgrade the plant to maintain current treatment capabilities, add chemical phosphorus removal and use water quality trading to meet a phosphorus limit of 0.1 mg/L would increase sewer user costs to \$860 per household per year, or 2.87% of MHI.</p>	

Economic Factor		Source
MHI	\$40,833	<a href="http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml">http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml</a>
Calculated preliminary screener	2.79%	From 4 EPA Worksheet D
Secondary score value	4	<b>Phosphorus Final Compliance Alternatives Report:</b> Municipal WWTF's Secondary Indicators from the MDV Implementation Guidance

### Section IX: Multi-Discharger Variance Feasibility (*this assumes MDV approval*)

A. Does the facility meet the economic indicators to qualify for the MDV? ☐ Yes ☐ No ☒ Unknown

MDV secondary indicator score: 6

B. Is it technically and economically feasible for this permittee to comply with a phosphorus WQBEL of 1 mg/L or lower? ☐ Yes ☒ No ☐ Unknown

C. Justification for considering an individual variance in lieu of the MDV:

Lime Ridge is ineligible for the MDV because the facility cannot meet a phosphorus limit of 1.0 mg/L or lower.

### Section X: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

- Reviewed users and reaffirmed there are no commercial and industrial users to survey.
- Influent samples were taken. The data is reflective of typical municipal domestic wastewater. The wastewater doesn't show there is excessive domestic phosphorus use occurring.
- Chemical addition would cause long-term negative impacts to the facility. For a recirculating sand filter facility:
  - Adding chemical to the primary settling zone would result in excessive chemical use and sludge buildup.
  - Chemical addition to the dosing chamber increases the possibility of clogging the sand filter with solids.

The Village has performed optimization, source reduction, and evaluated minor facility upgrades for TP compliance and has determined that the current WWTF will not be able to meet proposed final TP limits and cannot afford an upgrade at the WWTF. Therefore, the Village is requesting an Individual Phosphorus Variance for Municipal Discharges as listed under Wisconsin Statute 283.15.

**Citation:** 4<sup>th</sup> Year Phosphorus Report (Facility Plan); prepared by Delta 3 Engineering, Inc.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

The permit contains a variance to the water quality-based effluent limit (WQBEL) for phosphorus granted in accordance with s. 283.15, Wis. Stats. As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation specified in the permit, (b) implement the phosphorus pollutant minimization measures specified in the Phosphorus Pollutant Minimization Plan dated April 23, 2020, and (c) perform the actions listed in the schedule section of the permit. (See Schedules Section of permit).

Below is a summary of the tasks the facility will be doing annually during the permit term.

#### 1. Reduce Influent Phosphorus.

